



THE GEOLOGICAL SOCIETY OF MINNESOTA

News

*Volunteer
opportunities,
field trips,
lectures, and
public service,
since 1938*



GSM President, Dick
Bottenberg

From the President's Desk...

It was a friendly fall that held off winter as long as it could. But now winter has come, and snow will likely impact our lectures. The GSM will make any decision canceling or postponing a lecture due to inclement weather no later than 3 PM the day of the lecture. This information will be posted on the GSM home page. So remember to check the GSM website for lecture status. Additionally, we will e-mail lecture postponing and cancellation information as needed.

At the end of 2016 the GSM finds itself financially sound with healthy programs. I am happy to report that the GSM is strong and is fulfilling its mission. We do this by sponsoring free lectures and labs, conducting field trips, holding classroom presentations for schools, maintaining a media library, publishing relevant information for public distribution, maintaining and expanding upon a series of geological markers located throughout the state, and by promoting Minnesota geology at a State Fair booth.

GSM Board membership is solid as we transition to 2017. Thank-you to Becky Galkiewicz and Mark Ryan who leave the Board after 4 years of service. Becky has led the resurgence of the Marker Committee as they have initiated efforts to survey the location and status of existing markers and to replace/upgrade the Minnehaha Falls markers. Mark stepped up to lend his photographic talents and editing skills to the Newsletter. We welcome our two new Board members Deborah Naffziger and former Board President Dave Wilhelm who has volunteered for more!

Next, I would like to address our progress on the Board's four goals for 2016:

Install new markers at Minnehaha Falls

Plan in place and funding in place to design and install a new big picture marker, completion is now expected this spring. Will address the missing markers this spring.

Develop a GSM marker database and survey the markers

This effort was started last summer and is ~50% complete. Plan to complete in 2017.

GiveMN - establish a home page to encourage donations to the GSM

Complete. Please go on line and check it out!

<https://www.givemn.org/project/marker-project581695a78c3ec>

Videotape a lecture sometime during the 2016 fall lecture series. Determine if videotaping is feasible

We did an initial sound and viewgraph recording on 24 Oct. Plan to videotape the lecture on 7 November and determine our go forward plan this year.

Thanks to all the volunteers and leaders who made 2016 a great geological year. Gotta dig it!

Dick Bottenberg

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Facebook!



from the GSM archives:
Field trip the Mesabi Mtn
Mine, Virginia, Mn., July
1941.



GSM News

Officers:

Dick Bottenberg, President
Theresa Tweet, Vice President
Mary Helen Inskeep, Treasurer
Open Position, Secretary

Board Members: Kate Clover, Dan Japuntich, John Jensen; Ruth Jensen; Deborah Naffziger; and Dave Wilhelm

Editors: Theresa Tweet; Mark Ryan; Harvey Thorleifson; Rich Lively

Web Site: www.gsmn.org

The Geological Society of Minnesota is a 501(c)3 nonprofit organization. The purpose of this newsletter is to inform members and friends of activities of interest to the Geological Society of Minnesota.

Send all GSM membership dues, change of address cards, and renewals to: Joanie Furlong, GSM Membership Chair, P.O. Box 390555, Edina, MN 55439-0555; Membership dues are: \$10 Full-time students; \$20 Individuals; \$30 Families

GSM News is published four times a year: **February 15, May 15, August 15, and November 15.** Deadline for article submission is the first of the month, before the date of publication.

Newsletter contributions welcomed

Of interest to our GSM enthusiasts: While out and about enjoying your vacation time – when you visit a site that you find interesting, please consider sharing your experiences with us by writing up a few words and sending it to Theresa Tweet at phoenix8185@gmail.com. Thank you in advance!

New GSM Members!

Bill Mitchell; Minneapolis
Mary Ann Arneson; Lakeville
Joseph Eastman; Minneapolis
Mike & Joyce Palazzotto; Woodbury
Mandy Jackson; Minneapolis
Daniel & Diane Stauner; New Hope
Amy Linnerooth; Mankato
Evan Martin; Minneapolis
Sean Haugan; Coon Rapids
Jim Curme; Golden Valley
Matthew Schaut & Jean Emmons; Mpls
Janet Rohlf
Cathy West; Farmington
David Kelso; Circle Pines

GSM Board Membership

The GSM Board consists of members who have a special interest in advancing the goals of our society, including lectures, field trips, and community outreach. The Board currently has nine members. Our bylaws limit the terms of Board members to four years, to encourage a turnover of perspectives and ideas. The Board typically meets quarterly, on the second Thursdays of February, May, August, and November, or a different date if conflicts arise. We typically meet from 7 to 9 PM at the Minnesota Geological Survey at 2609 W Territorial Rd, St. Paul MN 55114.

Board meetings are open to all members of GSM. So, whether you are a new member of GSM or have been a member for many years, if Board membership is something that might interest you, or you are just curious to see what our Board does and how it works, we encourage you to attend a meeting. And, if you have a topic you would like the Board to consider, please contact Theresa Tweet at phoenix8185@gmail.com.

2016 GSM Holiday Gathering

Ed and Sandy Steffner will again be opening their doors to the GSM clan. The Steffners will welcome guests on **Saturday, December 10 at 3:30 PM for appetizers, and 5 PM for the Pot - Luck Dinner; there will be no board meeting again this year. For food plans and the address please contact Sandy at: ssteffner41@gmail.com**

Thank-you State Fair Volunteers!

It has been an honor being the State Fair Committee Chair again this year! What a Hoot! I would like to personally thank all of the volunteers for representing GSM this year at the State Fair. Everyone showed up on time with very few changes of personnel or times. The booth set-up and take-down went flawlessly. The booth was kept clean and functional by all of you. By the record number of brochures we gave out, I think that our visitors showed a real interest. If you would like to be on the committee for next year, or if you have ideas to further

improve the booth, please email me:

danjap7@yahoo.com

Thanks so very much!

Dan Japuntich, GSM State Fair Committee Chair

GSM DONATIONS

At this time we have our Geological Society of Minnesota site up, and running on the **GiveMN** webpage, check it out using this link: <https://givemn.org/organization/416038624-29672>

Member Spotlight; Ted Chura

1. How long have you been a GSM member?

I have been a GSM member since I don't know when, but less than 100 years. I was born the same year as GSM so I guess I was destined to be a member. I served as Treasurer for several years. It was interesting and



Ted (striped green and white shirt) talking with Rich Utke

amusing to see what some non-accountants did in struggling to keep good records. Gail Marshall was the membership chair at the time and we always reconciled our records together. She was an Accounting Manager at work. I would call her up and say, "This is General Ledger, is the Marshall in?"

2. How did you get interested in geology?

I have always been interested in rocks and minerals and anything scientific. When a preschooler, I pulled up a plant, brought it inside the house and asked my dad what it was. And, another time about that age my dad and I were looking up at the stars and I asked how did we get so small. I was always curious about everything. I wish my offspring would have the same curiosity. We (well, I) even picked up rocks on our honeymoon. I am trying to cut back on accumulating more; really I am (maybe it will come true!). A milestone in my life was when everyone finally came to believe in plate tectonics.

3. What do you dig about the GSM?

I like the GSM because of the mix of lay people and academic. It is a good mix. When I joined there were a number of old timers with excellent academic or work experiences. Some made significant donations to the

GSM in the form of video series, etc. It is always exciting to go on field trips. Years past it was the custom for two academic individuals to make a trip out west gathering materials and information for a field trip the next year. Field trips were every other year with reconnaissance done during the in between years. Now there are some every year. It is also fun to volunteer at the State Fair. You meet some very interesting people. During my first time volunteering a fellow came up and had a friend that inspected ships and had an enormous collection of ores. He was going back to his home in Germany and wanted to find a home for his collection. I would have liked to have had it but didn't feel I was qualified or deserving of it. I just didn't know what to do with that information at the time. Thank you to all the volunteers who give so much to us as members.

NOTES FROM THE PAST

Submitted by Katy Paul

From the GSM NEWS – Summer 1997

SCHOOL OUTREACH STRETCHED

The GSM School Outreach Program for the '96-'97 school year was active between mid-December and mid-May. Our presenter visited twenty-five Metro area elementary schools that spanned the socioeconomic gamut, and talked to more than 2,000 students. What was impressive were the common threads of dedicated, hardworking teachers and talented children. No school district has an exclusive on either! What was of concern was the large disparity in materials and resources between the school districts visited. Many teachers who contacted us requesting presentation information ultimately could not find the money to pay the \$15/class fee we give the college student presenter. Several paid for it, apparently, with their own money. The creation of a small scholarship fund might be in order for future instances of just such a nature.

GSM Annual Banquet

The September 12 GSM Annual Banquet began with a delicious U Gardens buffet, good conversation, and the Board Election. Joanie F. handled new and renewed memberships, and Randy S. worked the Video Library table. There was a Marker Project update from Becky G., and a thank you from Dan J. to State Fair volunteers. And then, Steve introduced our guest speaker - our own Kate Clover, who spoke on **The Wondrous World of Carbonate Sands**. Until Kate's lecture, I never really thought about beaches or sand grains. I do understand that there are rock beaches containing agates, garnets and the like, but as Kate presented in her talk, there are also beaches that are composed predominately of mollusks, barnacles, gastropods, bivalves, and coral pieces. These are called carbonate sand beaches. Kate's been a writer and a researcher for many years, and for these many years she has loved observing objects under the lens of a microscope. Curiosity took hold of Kate early on and she moved on to examine the subject of

taphonomy i.e. the study of how an organism breaks down after death. When a living thing dies, the soft tissues decay, and this leaves behind the stronger matter of the creature. The sun bleaches the corals and other



Sand, Playa Cazon, Samana, Dominican Republic

wind and in the process you will find that the more resilient parts of the shells will be left as very well polished grains. What can you expect to see under a microscope? Once you are able to observe some of the intricacies of the pieces that have been washed up on shore, an alternate ecosystem emerges: marine bivalves and snails drill or bore holes through the surfaces of



Kate, on the right, discussing sand and shell samples

other shells, and they consume these other shellfish. Parrot fish and urchins graze on coral beds, algae grows on the coral beds as well; barnacles and worms encrust almost anything. Bryozoans grow in colonies and show minute zooid openings. At one point I looked at sand as just naturally occurring particles of a certain size. However, after hearing Kate's talk, I learned that there are a vast number of differences in the content of the sand depending on its' place of origin – quite extraordinary!

Theresa Tweet

GSM Field Trips

We have had one excursion since the Fall 2016 Newsletter was issued. On October 1, Randy Strobel led a few GSM members on a tour of **sustainable homes** (and yaks) southeast of the Twin Cities. See Vern Schaaf's report in this issue. Also in this issue, Deborah Naffziger reports on the first half of our four-day July field trip to various sites and facilities on the **Mesabi Iron Range**; she'll report on the second half in the next newsletter. Thanks to Vern and Deborah for sharing these trips with the rest of our members. I have started

summarizing our past field trips on the GSM web site. To date, I have completed this back to 2013. To see these, click "GSM Field Trips" in the left margin of the home page, then click the year. I especially recommend these summaries to new members to learn more about GSM. Recently, I asked members for their interest in a possible field trip to see the **total solar eclipse** on August 21, 2017. As of October 29, over 30 persons have expressed significant interest in such a trip, so I will continue planning. If you are interested and have not yet responded, do so immediately to me at dewilhelm53@msn.com, as I will direct further e-mails on this subject only to those who have indicated interest. I plan to schedule another tour this winter of the St. Anthony Falls Lab, assuming sufficient interest. We'll likely do another tour of the Wildlife Science Center this winter, when the animals are more active (to maintain body heat). Two other possibilities that we are investigating are a trip to Chicago to visit museums and a March trip to the Lake Mead area. Members will receive e-mail on these possibilities and any others that arise when there is sufficient detail. As always, contact me with ideas for other field trips that would interest you.

Dave Wilhelm, Field Trip Coordinator

2016 Sustainable Home Tours

On October 1st, Randy Strobel, Joan Furlong, David Wilhelm, and Vernon Schaaf toured four sustainable home sites. It proved to be an enjoyable day thanks to great weather, beautiful scenery, unique home styles, and unusual farm livestock. Our first stop was *Clear Spring Farm* located in Welch. To our surprise, this farm raised yak. A herd of thirty Tibetan and Royal yak made it the largest such farm in Minnesota. The barn featured displays of yak products, including leather chopper mittens, yarn, yak burgers, and yak chili. The barn and house were heated by geothermal energy from onsite wells. A 24.5 kW solar array attached to the animal shed roof provided that building's electricity. The second site, *Suns Warmth Sustainable Home*, is a geodesic dome house near Red Wing. The house is not connected to the electric grid. Renewable energy systems are used, including a 1 kW wind generator, a 10 kW fuel-powered generator, and 1.4 kW of solar electric. The house features passive solar heating, as well as a floor radiant heat system. Of special interest inside were



Yaks Grazing



Solar Photovoltaic Array on Yak Shed



Geodesic dome

rigid copper piping (lots of soldering) for railings, and compressed bamboo



Geodesic dome —Interior

boards (lots of miter cuts) for the interior dome structure. The third site was an earth home near Wabasha. The house receives its electrical power from 35 silicon panels attached to the roof of a metal storage building. A group of investors provided full funding for the project. In return for financing, they claimed tax credits and other incentives to recoup their costs. After ten years, the customer gets complete ownership of the installation, after enjoying ten years of utility savings, and with no capital



Earth-sheltered Home

investment. It sounded too good to be true. The final stop was in Winona. This residential home contains 36 silicon solar panels on the roof, producing 9.9

kW of solar energy. Our thanks to Randy Strobel for making us aware of this event. It was my first exposure to a yak farm, a geodesic dome house, and residential solar electric panels. It was an interesting trip for all.

Vernon Schaaf

Iron Range Tour Part 1

On a hot steamy Wednesday afternoon, July 20th, we left the Twin Cities for the cool of the Iron Range, as well as lots of good rocks. The drive was pleasant with chat and scenery, and we arrived at the Chisholm Inn and Suites about 7 PM or so. We connected with others, and many of us went to “the Italian Place” in Chisholm, Valentini’s Supper Club, where they make their own pasta. It was really good. It seems a restaurant must be very good to survive the boom and bust cycle of the range.

Wednesday night there was a big thunderstorm, which



Inactive Glen Mine

was not bad in Chisholm or Hibbing, but took out power from Ely to Duluth. Thursday dawned clear if warm and muggy, but

downright cool compared to the Cities.

The Minnesota Discovery Center, Museum of the Iron Range—formerly Ironworld—opened at 10 AM where we gathered for self-guided tours before our Hibbing Taconite tour of the Hull-Rust-Mahoning mine.

The complex is situated on the edge of the former Glen Mine pit, and affords some spectacular views. Across the highway is the Iron Man, not the comic book guy, but a giant statue of an Iron Miner. At 12:15, 29 of us watched a video on taconite processing prior to boarding the bus for the mine tour. With our hard hats and goggles, we all clambered aboard the school bus, and drove off to the mine. We drove out St. Louis County Highway 5, but don’t go that way next year, because the road will be demolished so the mine can be expanded further. One thing I came to understand is that nothing is permanent on the range. Roads, hills, houses, towns—everything is transient when it comes to mining. And people are transient as well—with the boom and bust cycle of mining many people come and go in generations. On the Range, there are so many abandoned mines, both pit and underground, that trekking through the woods is discouraged. Even the forest is second and third growth—everything was clear cut before the mining started. This was lumber country before it became mining country.

75% of the iron that we used in WWII came from the Iron Range of Minnesota. It is one of the largest reserves of iron ore on the planet—those stromatolites sure did their thing here big time. After WWII, with most of the high grade 65-70% ore mostly mined out, there was a fear the range was dead—and then the taconite process became commercially viable. It was patented by a professor, Edward Wilson Davis from the University of Minnesota. He started his research in 1913, and eventually earned 19 patents for his innovations. With taconite, 25-35% siliceous ore is mined, crushed to dust and magnetically separated, mixed with bentonite clay, and baked into 1-cm pellets which ship to blast furnaces out east. The furnaces had to be modified to use taconite, and now all the plants use taconite, which means they cannot refine the old higher grade ore anymore—those minerals aren’t magnetic, as the siliceous ones are. There are at present two grades of ore—high and low and they mine and mix the loads to get a uniform grade of ore to keep the taconite pellets consistent. The original iron mines were along faults which concentrated the high-grade ore by deep water removing the silica. Most of the original mines were underground. Then as the high grade ore was mined out, the operations changed to open-pit. Even now



Iron Man, Chisholm, Mn



Hull-Rust-Mahoning mine

when blasting, tunnels and equipment from old underground mines are occasionally discovered, and some are saved as exhibits at the Museum and in the mines themselves.

We drove down into the pit, past new facilities for crushing, separating and concentrating the ore into taconite pellets. The mine itself is 3.5 x 8.5 miles, and is a consolidation of many smaller, older mines. The mine will expand to take Highway 5 next year, but Highway 169 is safe. The present geological conjecture is that the ore body can be correlated to the iron formations in Northern Michigan and Wisconsin, though more folded and faulted there. The formation dips to the SE in Minnesota, and supposedly the rift volcanics buried it, and the Grenville Orogeny folded and faulted the Eastern end. As we listened at the overlook, many people surreptitiously gathered rocks as souvenirs of their trip to the mine. They never said we couldn't, and the bus driver looked indulgently as we brought our rocks back onto the bus. Well, there were certainly enough spare rocks around for collectors.

They have 700 workers at the Hull-Rust Mine split evenly between the pits and the refining operations. About 90% of those 700 workers are in the Steel Workers Union. The open pits can go profitably to 700 feet deep at present. And probably they will devise a system which allows them to go deeper in the future—there is still plenty of ore to keep mining as they are into the next century—providing the price for iron ore stays profitable. This is what makes for the boom and bust cycle. Present regulations require that tailings be sloped and vegetated to 90% within 3 years, and allows 10 years for 95% of the old tailings be grown over. Most of the big hills you see driving along the range are old tailing piles, and some of those might be mined for ore in the future with new technologies. Tailings from a 65% mine still have lots of 25% ore there.

Back to the Discovery Center, and more touring of the Museum center. There are four buildings, and there was a craft fair that day. Many were impressed with the library and genealogical resources for people with relatives that may have lived on the range.

We took an afternoon trolley tour to an assembled historical mining town, made up of buildings moved from various places around the range. Early houses

were built on skids, so they could be moved easily.

Later we got a treat—Gary Kaunonen, a labor historian, gave a talk about the 1916 strike on the range. He did much of his research in the library at the center, and July 21, 1916 (100 years to the day) was the start of the trials of arrested workers.



Glen Mine Trolley

Suffice it to say, that strike was not successful but it put the Wobblies (International Workers of the World) in the spotlight, and planted the seeds of organization, that made the efforts of the 30's and 40's successful for unionization of the Range, mine by mine.

In the evening, we ate at the Sportsman Bar in Hibbing, and it was good food as well. You can find more photos of the field trip page of n the GSM web site.

Friday, the 24 of us were up early, with a fine breakfast at the Chisholm Inn and Suites. We drove to the Hull Rust mine overlook in Hibbing, our first stop for the day. Like so much on the Range, the mine's visitor

center will be moved in two years, so that part of the pit can be mined. We watched trucks and a grader construct a road across the pit in



Hill's Finnish Boarding House and Laundry

anticipation of that expansion. They plan many years ahead with this mine operation.

The visitor center was adjacent to the 'old Hibbing' park, a grassy space with streets, driveways and sidewalks to nowhere. The town had been there, but was moved many years ago to accommodate future mining.

Randy Strobel gave a nice talk about the formation of the mine—it was originally the Animikie Basin, which stretched across much of what is now the Midwest, and



Glen Mine Electric Shovel



Drill Rig

water's edge moved back and forth with time, the stromatolites and other cyanobacteria did their thing—turning CO₂ to O₂, and causing iron to precipitate out of the water and be mixed with regular sediments. There was no oxygen atmosphere in those remote days, over 2 billion years ago. Once all the iron was precipitated out of the oceans, the excess O₂ ended up in the atmosphere, and here we are! Talk about a pollution crisis—over 98% of all organisms alive before the precipitation were made extinct by the—to them—poisonous oxygen. Extremophiles are their descendants—living in remote oxygen-poor areas of the planet. When the mid-continent rift started about 1 billion years ago, the heated groundwater further refined and concentrated the ore. Then the end of the Grenville Orogeny halted the rift, and things calmed down to form the present peneplain. The iron ore was finally discovered in the 1880's and mining began shortly thereafter.



Drill Core Library and Core, Hibbing, Mn

Our second stop was the Minnesota DNR Drill Core Library in Hibbing. For those of us who love rocks, it was great! There is a smaller office building, and we walked a block to one of the giant warehouses where the drill cores are stored. This is the motherlode of drill core, with several million feet of cores dating from about 1900 to the present.



Donning hardhats, we saw many racks

of stored cores—8 levels of super industrial-strength shelving with boxes and boxes of cores, all labeled and indexed in their database. They use an electric lift which is wire guided—wire is set into the concrete floor, and that guides the lift—to get the boxes of cores on and off the shelves.

Legislation passed in 1986 requires a portion of all cores taken in Minnesota to be shipped here and stored. Not all states and provinces have core libraries like this - ours is one of the biggest and most complete. If those cores are proprietary, they can be locked and excluded from public inspection. Present cores from the companies exploring for Ni-Cu-PGE on the Range are all locked away. Twin Metals cores go very deep—the ore minerals are laced throughout the rock, and so all the cores need to be individually analyzed. When the mine opens, they will

as the refine the rock underground, and use the tailings to backfill mined-out tunnels, which seems quite environmentally sound. The cores are used for research, both scientific and industrial. Glacial sediments are saved in plastic sleeves. A new building will be needed soon. They no longer



200-ton Truck Dumping Waste Rock

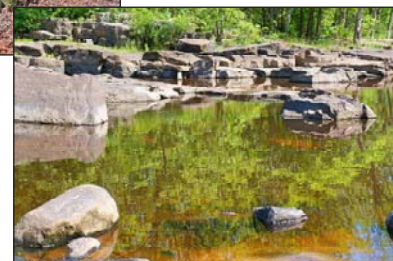


Old Mine Pit

Analysis is done on site; they have a nice little lab. Much data comes digitally nowadays, though they still have a lot of paper, which they are scanning and slowly

putting online as digital data, which is publically accessible. Lunch was catch-as-can and our small party ate in the park across from the DNR building. We even found the GSM marker in the park, and logged it for the marker project, with Gratia Reynolds listed as finder. The rest of the afternoon was spent visiting rock sites scouted out by Randy. We all got a lot of samples. Friday was much hotter and more sticky than Thursday—temp in Grand Rapids was 88 with a dew point of 66. But in the Cities it was 96 with a dew point of 66—heat index 106. Shudder. Better to be up on the Range picking rocks. We drove to Grand Marais, turned off at mile 3.4 on a smaller road, parked, and walked into the woods and saw Pokegama quartzite, part of the whole iron formation. Next site was by the Mesabi Trail, and ½ mile down a road we ended up at the edge of a lake—an old mine, and on

a giant pile of tailings—many beautiful rocks to bring back. The lake was red at the edges of the tailing pile, from dissolved



Quartzite in Stream



Gratia with the Hibbing GSM Marker

iron. The third site was by a dam, and we collected more quartzite, and saw glacial striations. We took a group picture by the creek. The fourth site was another giant tailings pile off the Mesabi Trail, and more rocks were collected. By the fifth site, I was pooped. I stayed in the car and missed the beautiful view, but it was cool and I was enjoying my car's AC. Then we went back to the motels. The group went to eat at Grandma's BBQ in Hibbing. I was thoroughly exhausted, but having a ball with a great bunch of people!

Deborah Naffziger

To be continued in the February newsletter...



Iron Range Field Trip Participants!



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